International Journal of

HYDROGEN ENERGY

Editor-in-Chief
T. NEJAT VEZIROĞLU

Associate Editor
J. W. SHEFFIELD

Editorial Board
H. K. ABDEL-AAL, P. AZOU, G. BEGHI, R. E. BILLINGS, D. L. BLOCK, J. O'M. BOCKRIS, R. H. CARTY, W. J. D. ESCHER, J. E. FUNK, D. P. GREGORY, H. P. HARRENSTEIN, S. KAKAÇ, K. F. KNOCHE, C. MARCHETTI, A. R. MARTINEZ, T. OHTA, J. POTTIER, A. N. PROTSENKO, M. V. C. SASTRI, G. D. SAUTER, D. S. SCOTT, W. SEIFRITZ, P. K. TAKAHASHI, B. J. TAYLOR, H. VANDENBORRE, W. D. VAN VORST, ASHOK K. VIJH, K. H. WEIL, C.-J. WINTER, Y. ZHU

Volume 16, 1991

Volume Contents and Author Index

PERGAMON PRESS

OXFORD • NEW YORK • SEOUL • TOKYO

International Journal of
HYDROGEN ENERGY

Official Journal of the International Association for Hydrogen Energy

P.O. Box 248266, Coral Gables, FL 33124, U.S.A.

EDITOR-IN-CHIEF: T. Nejat Veziroğlu, College of Engineering, University of Miami, Coral Gables, FL 33124, U.S.A.

ASSOCIATE EDITOR: John W. Sheffield, Mechanical and Aerospace Engineering Department, University of Missouri-Rolla, Rolla, MO 65401, U.S.A.

NEWS EDITOR: H. Roger Hinds, P.O. Box 362, S. Lake Tahoe, CA 95705, U.S.A.

LEGAL COUNSELOR: Melvin C. Morgenstern, Semet, Lickstein, Morgenstern & Berger, P.A., 201 Alhambra Circle, Coral Gables, FL 33134, U.S.A.

SECRETARY-TREASURER: Bengi Veziroğlu, International Association for Hydrogen Energy, P.O. Box 248266, Coral Gables, FL 33124, U.S.A.

Publishing, Subscription and Advertising Offices: Pergamon Press plc, Headington Hill Hall, Oxford OX3 0BW, U.K. (*Oxford* 794141; *Telex:* 83177).

Annual Subscription Rates 1992/93 (including postage and insurance)

Annual institutional subscription rate (1992) £445.00 ($710.00). Two Year Institutional rate (1992/93) £845.50 ($1349.00). Sterling prices are definitive. US Dollar prices are quoted for convenience only, and are subject to exchange rate fluctuation. Prices include postage and insurance and are subject to change without notice. The members of the International Association for Hydrogen Energy receive the journal free. Subscription rates for Japan are available on request. Subscription enquiries from customers in North America should be sent to: Pergamon Press Inc., 395 Saw Mill River Road, Elmsford, NY 10523, U.S.A., and for the remainder of the world to: Pergamon Press plc, Headington Hill Hall, Oxford OX3 0BW, U.K.

Back Issues of all previously published volumes, in both hard copy and on microform, are available direct from Pergamon Press offices.

Change of address/Airmail delivery/Membership lists

1. IAHE members changing their address should write to: IAHE Co-ordinator, P.O. Box 248266, Coral Gables, FL 33124, U.S.A. Other subscribers changing their address should write to the Publisher at the address below.
2. Members and subscribers in Europe, North America and Japan receive their copies by air at no extra charge. Your journal can be posted by airmail to other parts of the world and details of airmail postal rates can be obtained from the address below.
3. The IAHE membership list can be purchased from the Publisher at £82.00 ($132.00) per 1000 addresses.

Enquiries on the above should be sent to: Mr B. Cox, Pergamon Press plc, Headington Hill Hall, Oxford OX3 0BW, U.K.

Published Monthly

Copyright © 1992 International Association for Hydrogen Energy

It is a condition of publication that manuscripts submitted to this journal have not been published and will not be simultaneously submitted or published elsewhere. By submitting a manuscript, the authors agree that the copyright for their article is transferred to the IAHE if and when the article is accepted for publication. However, assignment of copyright is not required from authors who work for organizations which do not permit such assignment. The copyright covers the exclusive rights to reproduce and distribute the article, including reprints, photographic reproductions, microform or any other reproductions of similar nature and translations. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, electrostatic, magnetic tape, mechanical, photocopying, recording or otherwise, without permission in writing from the copyright holder.

Whilst every effort is made by the publishers and editorial board to see that no inaccurate or misleading data, opinion or statement appears in this journal, they wish to make it clear that the data and opinions appearing in the articles and advertisements herein are the sole responsibility of the contributor or advertiser concerned. Accordingly, the publishers, the editorial board and editors and their respective employees, officers and agents accept no responsibility or liability whatsoever for the consequences of any such inaccurate or misleading data, opinion or statement.

Photocopying information for users in the U.S.A.

The Item-fee Code for this publication indicates that authorization to photocopy items for internal or personal use is granted by the copyright holder for libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service provided the stated fee for copying, beyond that permitted by Section 107 or 108 of the United States Copyright Law, is paid. The appropriate remittance of $3.00 per copy per article is paid directly to the Copyright Clearance Center Inc., 27 Congress Street, Salem, MA 01970.

Permission for other use

The copyright owner's consent does not extend to copying for general distribution, for promotion, for creating new works, or for resale. Specific written permission must be obtained from the publisher and the IAHE for such copying.

♾ The paper used in this publication meets the minimum requirements of the American National Standard for Information Sciences—Permanence of Paper for Printed Library Materials, ANSI Z39.48–1984.

The Item-fee Code for this publication is: 0360–3199/91 $3.00 + 0.00

CONTENTS TO VOLUME 16

NUMBER 1

A. C. D. Angelo, E. R. Gonzalez and L. A. Avaca	1	Mechanistic studies of the oxygen reactions on $NiCo_2O_4$ spinel and the hydrogen evolution reaction on amorphous Ni–Co sulphide
M. M. Taqui Khan and J. P. Bhatt	9	Photosensitized production of hydrogen by *Halobacterium halobium* MMT_{22} coupled to *Escherichia coli* in reversed micelles of sodium lauryl sulfate in organic solvents
L. Brossard	13	Electrocatalytic performance for alkaline water electrolysis of Ni electrodes electrocoated with Fe or Fe/Mo
P. Selvam, B. Viswanathan, C. S. Swamy and V. Srinivasan	23	Surface properties of $LaNi_5$: a reinvestigation
P. Selvam	35	Energy and environment—an all time search
W. P. Hutny and G. K. Lee	47	Improved radiative heat transfer from hydrogen flames
D. Klvana, A. Touzani, J. Chaouki and G. Bélanger	55	Dehydrogenation of methylcyclohexane in a reactor coupled to a hydrogen engine
Comment		
S. Trasatti	61	A note on the paper by P. C. Searson, P. V. Nagarkar and R. M. Latanision, "The effect of density of states, work function and exchange integral of polycrystalline and single crystal surfaces on the hydrogen evolution reaction"
M. Watanabe and P. Stonehart	63	Hydrogen Energy News and Views
	67	Calendar of Events
	69	Hydrogen Energy and Energy Related Publications
Announcements	77	International Hydrogen Energy Symposion and Special Exhibition on Hydrogen Technology, Frankfurt am Main, Germany, 9–15 June 1991
	78	Energex 91, Second International Conference, Energy for the Americas, San Juan; Puerto Rico, 24–29 September 1991
	79	Twenty-second Midwestern Mechanics Conference, University of Missouri-Rolla, Rolla, Missouri, U.S.A., 6–9 October 1991
	81	International Association for Hydrogen Energy

NUMBER 2

M. M. Taqui Khan and J. P. Bhatt	83	Photosensitized continuous production of hydrogen by *Halobacterium halobium* MMT_{22} coupled to *Escherichia coli*
L. Brossard	87	Oxygen discharge on nickel and cobalt anodes in 30 w/o KOH at 70°C in the presence of dissolved iron and vanadium
Hyo-Jun Ahn and Jai-Young Lee	93	Intrinsic degradation of $LaNi_5$ by the temperature induced hydrogen absorption–desorption cycling

M. SINGH, Y. K. VIJAY and I. P. JAIN — 101 The effect of a sulfur layer on FeTi thin films obliquely deposited for hydrogen storage

G. KASKE, P. SCHMIDT and K. W. KANNGIEßER — 105 Comparison between high-voltage direct-current transmission and hydrogen transport

H. B. MATHUR and L. M. DAS — 115 Performance characteristics of a hydrogen fuelled S.I. engine using timed manifold injection

Y. S. H. NAJJAR — 129 A cryogenic gas turbine engine using hydrogen for waste heat recovery and regasification of LNG

Y. TSUJIKAWA, Y. TSUKAMOTO and S. FUJII — 135 Performance analysis of scramjet engine with quasi-one-dimensional flow model

H. R. HINDS — 143 Hydrogen Energy News and Views

R. F. ALIMOVA, L. F. GOL'TSOVA, V. A. GARKUSHEVA, I. V. LUKASH, L. B. MAKSIMAL'DO and M. P. EL'KONIN — 147 Bibliography on the Hydrogen Energy and Technology (USSR) (Editors-in-chief: V. A. Gol'tsov and V. K. Popov)

159 Calendar of Events

161 New Patents

Announcements

163 ACHEMA 91, International Hydrogen Energy Symposion and Special Exhibition on Hydrogen Technology, Frankfurt am Main, Germany, 9–15 June 1991

164 Project Hydrogen '91, Seminar–Exhibits–Worksnop, Independence, Missouri, U.S.A., 16–18 September 1991

165 The First Exposition for Renewable Energy Equipment, Tripoli, Libya, 4–6 May 1991

167 An Invitation to Energy Scientists, Engineers and Planners

NUMBER 3

N. LUTFI and T. N. VEZIROĞLU — 169 A clean and permanent energy infrastructure for Pakistan: solar–hydrogen energy system

S. S. BHATTACHARYYA, A. ROY and S. ADITYA — 201 The anomalous photoresponse behavior of the TiO_2 semiconductor electrode: cyclic voltammetric studies

M. A. ROSEN — 207 Thermodynamic investigation of hydrogen production by steam–methane reforming

H. KRONBERGER, CH. FABJAN and G. FRITHUM — 219 Development of high performance cathodes for hydrogen production from alkaline solutions

M.-Y. SONG, H.-J. AHN and H.-R. PARK — 223 A study of the hydriding and dehydriding kinetics of a mixture of 2 Mg and Co

231 Calendar of Events

233 New Patents

Announcements

235 The First Exposition for Renewable Energy Equipment, Tripoli, Libya, 4–6 May 1991

236 ACHEMA 91, International Hydrogen Energy Symposion and Special Exhibition on Hydrogen Technology, Frankfurt am Main, Germany, 9–15 June 1991

237 Project Hydrogen '91, Seminar–Exhibits–Workshop, Independence, Missouri, U.S.A., 16–18 September 1991

238 Energex 91, Second International Conference: Energy for the Americas, San Juan, Puerto Rico, 24–29 September 1991
239 Twenty-second Midwestern Mechanics Conference, University of Missouri-Rolla, Rolla, Missouri, U.S.A., 6–9 October 1991
241 International Association for Hydrogen Energy

NUMBER 4

S. Cervera-March and E. S. Smotkin 243 A photoelectrode array system for hydrogen production from solar water splitting

R. Cai and G. Fang 249 Analysis of a novel hydrogen and oxygen combined cycle

T. Domschke, T. Nietsch and E. Schütt 255 The temperature-dependence of hydrogen sorption in metal hydrides

M. Terzieva, M. Khrussanova and P. Peshev 265 Dehydriding kinetics of mechanically alloyed mixtures of magnesium with some 3*d* transition metal oxides

M. V. Šušić and Y. M. Solonin 271 Kinetic and thermodynamic investigation of hydrogen absorption by ternary $LaNi_4Al$ and $LaNi_4Al$–Pd alloys

A. H. Zahed, M. D. Bashir, T. Y. Alp and Y. S. H. Najjar 277 A perspective of solar hydrogen and its utilization in Saudi Arabia

Book Review

M. V. C. Sastri 283 *Hydrogen Energy Progress—VIII (Proceedings of the 8th World Hydrogen Energy Conference)*. Edited by T. N. Veziroğlu and P. K. Takahashi

H. R. Hinds 285 Hydrogen Energy News and Views
289 Calendar of Events
291 Hydrogen Energy and Energy Related Publications

Announcements

299 The First Exposition for Renewable Energy Equipment, Tripoli, Libya, 4–6 May 1991
300 Workshop on Photovoltaics: Physics, Technology and Applications, Tripoli, Libya, 15–20 June 1991
301 ACHEMA 91, International Hydrogen Energy Symposion and Special Exhibition on Hydrogen Technology, Frankfurt am Main, Germany, 9–15 June 1991
302 Project Hydrogen '91, Seminar–Exhibits–Workshop, Independence, Missouri, U.S.A., 16–18 September 1991
303 Hydrogen–Metal Systems, Gordon Research Conference, Tilton School, 15–19 July 1991
304 International Symposium, ECOS '92, On Efficiency, Costs, Optimization and Simulation of Energy Systems, 15–18 June 1992
305 An Invitation to Energy Scientists, Engineers and Planners

NUMBER 5

E. Y. García and M. A. Laborde	307	Hydrogen production by the steam reforming of ethanol: thermodynamic analysis
I. H. Park, K. K. Rao and D. O. Hall	313	Photoproduction of hydrogen, hydrogen peroxide and ammonia using immobilized cyanobacteria
S. K. Megalofonos and N. G. Papayannakos	319	Hydrogen production from natural gas and hydrogen sulphide
H.-J. Pfriem	329	Overview of the cooperative program on hydrogen storage, conversion and safety of the International Energy Agency
K. A. G. Amankwah and J. A. Schwarz	339	Assessment of the effect of impurity gases on the storage capacity of hydrogen on activated carbon using the concept of effective adsorbed phase molar volume
T. Suzuki, T. Hirai and S. Hayashi	345	Enhancement of the ethylene conversion to propylene on reduced molybdena silica catalyst in the presence of hydrogen
P. A. Lehman and C. E. Chamberlin	349	Design of a photovoltaic-hydrogen-fuel cell energy system
Letters to the Editor		
J. Balej	353	Comment on the paper by E. Potvin, H. Ménard, L. Brossard and J.-M. Lalancette, "Electrocatalytic performance of phosphate-bonded composite cathodes for industrial water electrolyser"
L. Brossard	354	Response to the comment
H. R. Hinds	355	Hydrogen Energy News and Views
	359	Hydrogen Energy Related Organizations
	361	Calendar of Events
	363	New Patents
Announcements	365	Workshop on Photovoltaics: Physics, Technology and Applications, Tripoli, Libya, 15–20 June 1991
	366	Hydrogen–Metal Systems, Gordon Research Conference, Tilton School, 15–19 July 1991
	367	Project Hydrogen '91, Technical Seminar and Exhibits, Independence, Missouri, U.S.A., 16–18 September 1991
	368	Energex 91, Second International Conference: Energy for the Americas, San Juan, Puerto Rico, 24–29 September 1991
	369	Twenty-second Midwestern Mechanics Conference, University of Missouri-Rolla, Rolla, Missouri, U.S.A., 6–9 October 1991
	371	International Association for Hydrogen Energy

NUMBER 6

SPECIAL ISSUE: 8WHEC PAPERS NOT INCLUDED IN THE PROCEEDINGS

M. SCHREIBER, G. LUCIER, J. A. FERRANTE and R. A. HUGGINS — 373 — Intermediate temperature water vapor electrolysis

HYUN CHAI JUNG, KI SUN KIM, DAI HYUN YOON, SUNG YOUNG NAM and KYUNG HO SUN — 379 — The stability of PEC electrodes (TiO_2 anode and Pt cathode) and cell for H_2 production

K. S. CHANDRA BABU, D. SINGH and O. N. SRIVASTAVA — 387 — Preliminary investigations on the mixed oxide material TiO_2–In_2O_3 with regard to photoelectrolytic hydrogen production

I. N. GOGOTOV, N. A. ZORIN and L. T. SEREBRIAKOVA — 393 — Hydrogen production by model systems including hydrogenases from phototrophic bacteria

D. KUMAR and H. D. KUMAR — 397 — Effect of monochromatic lights on nitrogen fixation and hydrogen evolution in the isolated heterocysts of *Anabaena* sp. strain CA

S. P. SINGH and S. C. SRIVASTAVA — 403 — Isolation of non-sulphur photosynthetic bacterial strains efficient in hydrogen production at elevated temperatures

L. MARINESCU-PASOI, U. BEHRENS, G. LANGER, W. GRAMATTE, A. K. RASTOGI and R. E. SCHMITT — 407 — Hydrogen metal hydride storage with integrated catalytic recombiner for mobile application

B.-L. CHU, S.-M. LEE and T.-P. PERNG — 413 — Preparation and hydrogen absorption property of amorphous $Ti_{50}Fe_{50}$

A. V. BELOGUB and G. B. TALDA — 417 — Fuel supply system constructions of gasoline/hydrogen automobiles

A. V. BELOGUB and G. B. TALDA — 423 — Petrol–hydrogen truck with load-carrying capacity 5 tons

P. C. HANS and G. H. STINE — 427 — Spaceplane contributions to the hydrogen economy

433 — Calendar of Events

Announcements

435 — Project Hydrogen '91, Technical Seminar and Exhibits, Independence, Missouri, U.S.A., 16–18 September 1991

436 — Hydrogen–Metal Systems, Gordon Research Conference, Tilton School, 15–19 July 1991

437 — International Symposium, ECOS'92, On Efficiency, Costs, Optimization and Simulation of Energy Systems, 15–18 June 1992

439 — An Invitation to Energy Scientists, Engineers and Planners

NUMBER 7

M. P. NAIR, K. V. C. RAO and C. G. R. NAIR — 441 Effect of precipitation media on the photoelectrochemical properties of TiO_2–SiO_2 and TiO_2–SiO_2–RuO_2 photoanodes

M. P. NAIR, K. V. C. RAO and C. G. R. NAIR — 449 Investigation of the mixed oxide materials—TiO_2–SiO_2, TiO_2–SiO_2–Al_2O_3, TiO_2–SiO_2–In_2O_3 and TiO_2–SiO_2–RuO_2—in regard to the photoelectrolysis of water

S. STUCKI — 461 The cost of electrolytic hydrogen from off-peak power

D. LJ. STOJIĆ, Š. S. MILJANIĆ, T. D. GROZDIĆ, N. M. BIBIĆ and M. M. JAKŠIĆ — 469 Improvements in electrocatalytic separation of hydrogen isotopes

M. SINGH, Y. K. VIJAY and I. P. JAIN — 477 The effect of selenium layer coating and temperature dependence on TiNi thin films obliquely deposited for the hydrogen absorption mechanism

M. SINGH, Y. K. VIJAY and I. P. JAIN — 485 The temperature dependence of FeTi and $FeTiS_z$ thin films obliquely deposited for the hydrogen absorption–desorption mechanism

C. P. CHANG, J. K. WU, Y. D. YAO, C. W. WANG and E. K. LIN — 491 Hydrogen and deuterium in palladium

P. KORNREICH — 499 Hydrogen Energy News and Views

501 Calendar of Events

503 New Patents

505 Hydrogen Energy and Energy Related Publications

Announcements

513 Project Hydrogen '91, Technical Seminar and Exhibits, Independence, Missouri, U.S.A., 16–18 September 1991

514 Energex 91, Second International Conference, Energy for the Americas, San Juan, Puerto Rico, 24–29 September 1991

515 Twenty-second Midwestern Mechanics Conference, University of Missouri-Rolla, Rolla, Missouri, U.S.A., 6–9 October 1991

516 Hydrogen Fuelled Car Race

517 Hydrogen as a Renewable Energy Source for the Protection of the Environment, International Conference, Milan (Italy), 2–4 December 1991

518 Hydrogen 92, 9th World Hydrogen Energy Conference, Paris, France, 22–25 June 1992

519 International Association for Hydrogen Energy

NUMBER 8

R. E. SEARS, M. K. HEIDT, S. J. CISNEY and M. A. MUSICH — 521 Pilot-scale demonstration of producing hydrogen using low-rank coals

A. KOGAN, I. HODARA and M. VANA — 531 Steam flowrate to solar cavity reactor—a simple measurement and control method

M. P. NAIR, K. V. C. RAO and C. G. R. NAIR — 535 Photoelectrochemical properties of TiO_2–SiO_2 and TiO_2–SiO_2–RuO_2: dependence on the sintering atmosphere

M. N. MUNGOLE, K. N. RAI and K. P. SINGH 545 Hydrogen storage of $MmNi_{5-x}Al_x$ system based on Indian mischmetal

J. A. SERFASS, D. NAHMIAS and A. J. APPLEBY 551 A practical hydrogen development strategy

R. O. PRICE 557 Liquid hydrogen—an alternative aviation fuel?

C. MARCHETTI 563 Trying to help the environment—more on the West Ukraine case

Short Communication

C. CHRISTOFIDES and A. MANDELIS 577 Progress in hydrogen detection: a new photo-pyroelectric device

T. F. RUDDY 579 Hydrogen Energy News and Views

581 Calendar of Events

Announcements

583 Project Hydrogen '91, Technical Seminar and Exhibits, Independence, Missouri, U.S.A., 16–18 September 1991

584 International Symposium, ECOS '92, On Efficiency, Costs, Optimization and Simulation of Energy Systems, 15–18 June 1992

585 Hydrogen 92, 9th World Hydrogen Energy Conference, Paris, France, 22–25 June 1992

586 Flowers 1992, Florence World Energy Research Symposium, Firenze, Italy, 7–12 June 1992

587 '92 Earth Summit Energy Coalition forming the World Clean Energy Conference, Geneva, 4–7 November 1991

589 An Invitation to Energy Scientists, Engineers and Planners

NUMBER 9

M. ASHOKKUMAR and P. MARUTHAMUTHU 591 Photocatalytic hydrogen production with semiconductor particulate systems: an effort to enhance the efficiency

K. SASIKALA, CH. V. RAMANA and P. RAGHUVEER RAO 597 Environmental regulation for optimal biomass yield and photoproduction of hydrogen by *Rhodobacter sphaeroides* O.U. 001

H. ARASHI, H. NAITO and H. MIURA 603 Hydrogen production from high-temperature steam electrolysis using solar energy

P. YUE and F. KHAN 609 Methods for increasing photo-assisted production of hydrogen over titanium exchanged zeolites

P. SELVAM and K. YVON 615 Synthesis of Mg_2FeH_6, Mg_2CoH_5 and Mg_2NiH_4 by high-pressure sintering of the elements

L. M. DAS 619 Safety aspects of a hydrogen-fuelled engine system development

Y. S. H. NAJJAR 625 The over-expansion gas turbine cycle using hydrogen

K. HIRAOKA, K. WATANABE, T. MORISHITA, M. NOMURA, S. KAN, M. IKAME and T. SENDA 631 Energy analysis and CO_2 emission evaluation of a solar hydrogen energy system for the transportation system in Japan—I. Conceptual design of the system

Book Review
M. V. C. SASTRI 639 *Electrochemical Hydrogen Technologies—Electrochemical Production and Combustion of Hydrogen*. Edited by Harmut Wendt
H. R. HINDS 641 Hydrogen Energy News and Views
645 Calendar of Events
Announcements 647 Hydrogen as a Renewable Energy Source for the Protection of the Environment, Milan (Italy), 2–4 December 1991
648 FLOWERS 1992, Florence World Energy Research Symposium, Firenze, Italy, 7–12 June 1992
649 Hydrogen 92, 9th World Hydrogen Energy Conference, Paris, France, 22–25 June 1992
651 International Association for Hydrogen Energy

NUMBER 10

YU. I. KHARKATS and YU. V. PLESKOV 653 A plant for solar energy conversion and storage: "Solar array + electrolyser + storage battery". Computation of the non-steady-state operating conditions and design optimization
SU-IL PYUN and CHANG-HA KIM 661 Determination of donor concentration in anodically passivating polycrystalline TiO_2 films from analysis of nonlinear Mott–Schottky plots
O. SAVADOGO and E. FORGET 665 The hydrogen evolution reaction in a basic medium on nickel electrodeposited with $PW_{12}O_{40}^{3-}$
L. PETTERSSON and K. SJÖSTRÖM 671 Onboard hydrogen generation by methanol decomposition for the cold start of neat methanol engines
A. K. GUPTA, R. Z. PARKER and R. J. HANRAHAN 677 Gas phase formation of hydrogen chloride by thermal chlorine–steam reaction
M. M. TAQUI KHAN and J. P. BHATT 683 Polyethylene glycol mediated fusion of *Halobacterium halobium* MMT_{22} and *Escherichia coli* for enhancement of hydrogen production
A. Y. ESAYED and D. O. NORTHWOOD 687 Effect of alloy composition and temperature on hysteresis in V_xNb_{1-x}–H systems
J. GRETZ, W. KORF and R. LYONS 691 Hydrogen in the steel industry
J. HACOHEN, G. PINHASI, Y. PUTERMAN and E. SHER 695 Driving cycle simulation of a vehicle motored by a SI engine fueled with H_2-enriched gasoline
H. R. HINDS 703 Hydrogen Energy News and Views
707 Calendar of Events
709 Hydrogen Energy and Energy Related Publications
Announcements 717 Hydrogen as a Renewable Energy Source for the Protection of the Environment, Milan (Italy), 2–4 December 1991
718 FLOWERS 92, Florence World Energy Research Symposium, Firenze, Italy, 7–12 June 1992

719 9th World Hydrogen Energy Conference, Paris, France, 22–25 June 1992
720 International Symposium, ECOS '92, On Efficiency, Costs, Optimization and Simulation of Energy Systems, 15–18 June 1992
721 An Invitation to Energy Scientists, Engineers and Planners

NUMBER 11

C.-J. WINTER and M. FUCHS 723 HYSOLAR and Solar-Wasserstoff-Bayern
P. D. LUND 735 Optimization of stand-alone photovoltaic systems with hydrogen storage for total energy self-sufficiency
A. S. SULEYMANOV 741 On the possibility of the transformation of solar energy to chemical energy in the electrochemical cell with photoanode CdSe/TiO_2
H. K. ABDEL-AAL, H. H. HASSAN, M. A. MOHAMED and S. A. KHAIRY 745 Polymeric materials for photoelectrochemical cells for hydrogen production
DA-WEN SUN and SONG-JIU DENG 751 Major factors affecting the reaction rate in metal hydride beds
K. HIRAOKA, K. WATANABE, T. MORISHITA, M. NOMURA, S. KAN, M. IKAME and T. SENDA 755 Energy analysis and CO_2 emission evaluation of a solar hydrogen energy system for the transportation system in Japan—II. Evaluation of the system
L. M. DAS 765 Exhaust emission characterization of hydrogen-operated engine system: nature of pollutants and their control techniques
777 Calendar of Events
Announcements 779 NATO ASI on Multifunctional Mesoporous Inorganic Solids, Sintra, Portugal, 5–17 April 1992
780 FLOWERS 92, Florence World Energy Research Symposium, Firenze, Italy, 7–12 June 1992
781 9th World Hydrogen Energy Conference, Paris, France, 22–25 June 1992
783 International Association for Hydrogen Energy

NUMBER 12

T. N. VEZIROĞLU III Robert Maxwell 1923–1991
785 Acknowledgement of Reviewers
B. BEHZADIAN, D. L. PIRON, CHONGLUN FAN and J. LESSARD 791 Electrocatalytic effect on hydrogen evolution from copper materials plated from a chloride-containing bath
M. M. KHADER, M. M. HANNOUT and M. S. EL-DESSOUKI 797 Photoelectrochemical dissociation of water at silicon doped n-GaAs electrodes
K. PETROV 805 The Black Sea and hydrogen energy
S. FUKADA, T. YAMASAKI, H. MATSUO and N. MITSUISHI 809 The rate of an exchange reaction of hydrogen and deuterium in a Mg_2Ni bed

I. HAAS and E. SCHÜTT — 815 The effect of mechanical stress on the absorption of hydrogen by metal hydrides

R. ZIDAN, D. K. SLATTERY and J. BURNS — 821 Study of chemically synthesized Mg–MgH_2 for hydrogen storage

R. E. BILLINGS, M. SANCHEZ, P. CHERRY and D. B. EYRE — 829 LaserCell prototype vehicle

Book Review

F. BARBIR — 839 *Hydrogen Aircraft Technology*. By G. Daniel Brewer

841 Calendar of Events

Announcements

843 NATO ASI on Multifunctional Mesoporous Inorganic Solids, Sintra, Portugal, 5–17 April 1992

844 FLOWERS 92, Florence World Energy Research Symposium, Firenze, Italy, 7–12 June 1992

845 9th World Hydrogen Energy Conference, Paris, France, 22–25 June 1992

846 International Symposium, ECOS '92, On Efficiency, Costs, Optimization and Simulation of Energy Systems, 15–18 June 1992

847 The National Hydrogen Association's 3rd Annual U.S. Hydrogen Meeting, A Blueprint for Hydrogen's Future and A Workshop on Enabling Technologies, Washington, DC, 18–20 March 1992

849 An Invitation to Energy Scientists, Engineers and Planners

i Index to Vol. 16

Reproduced with the permission of Pergamon Press Inc., by University Microfilms Inc. Duplication or resale without permission is prohibited.